The Feasibility of a Home Based Exercise Intervention for Latina Breast Cancer Survivors

Jean M. Owen

A thesis submitted to the faculty of the University of North Carolina at Chapel Hill towards partial fulfillment of the requirements for the degree of Master of Arts in the Department of Exercise and Sports Science (Exercise Physiology).

Chapel Hill
2009

Approved by:

Dr. Claudio Battaglini

Dr. Robert McMurray

Dr. Diane Groff

ABSTRACT

Jean M. Owen: The Feasibility of a Home Based Exercise Intervention for Latina Breast Cancer Survivors
(Under the direction of Dr. Claudio Battaglini)

The purpose of the study was to examine the feasibility of administering a home based exercise intervention to post-treated Latina breast cancer survivors. A secondary purpose was to examine if a relationship exist between changes in physical activity (PA) levels and changes in depression, fatigue, and quality of life (QOL). Seven female Latina breast cancer survivors participated in the study. No significant change was found in overall PA (p=0.684) from baseline to the end of the study. A significant positive relationship between overall PA changes and changes in QOL scores ($rho(7) = 0.870$; $p = 0.024$), and a marginally significant inverse relationship between PA and depression ($rho(7) = -0.709$; p=0.074) was observed. Even though the exercise intervention appeared to not have increased overall PA, the relationships observed between PA and QOL, and the trend toward decreasing depression warrants further research.

To my maternal grandmother, Carabell Mitchell, a breast cancer survivor, who's dedication to health and fitness likely contributed to her long life of 100 years 10 months.

To my mother, Jean Gillespie, who was taken too quickly by ovarian cancer metastasis. Mom, you always believed in me and I know you are smiling down on me.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank many people who helped me achieve this enlightening and great task. I am so grateful to have had this opportunity not only to learn more about this evolving area of cancer care and the Latina community, but also to play a role in helping the wonderful women of Wake County's Fe, Amor y Esperanza breast cancer support group.

I specifically want to thank the following people;

Dr. Claudio Battaglini – my enthusiastic and supportive adviser. His care, guidance and Spanish language skills enhanced my experiences at UNC and with this study.

Dr. Diane Groff – for her idea to do the study with this group of Latina breast cancer survivors and her enthusiastic support.

Dr. Robert McMurray – for his overall support, guidance and expertise in accelerometry and especially for his belief in my success.

Jill Lucas, Kyle Leppert, Jason Diaz, Amy Lane, Matt Tenan, Jamie Ives – my wonderful and supportive classmates who helped and inspired me in so many way.

William J Owen – my wonderful husband who always supports me in everything I do. I could not have done this without his love and support.

My dear friends, Carol Abey, Nancy Mize, and Naomi Takeuchi who supported and prayed for me without fail.

Lidia Tiller and the ladies of Fe, Amor y Esperanza, who were very supportive of this study and have great faith, love and spirit. Your support of each other is very inspiring.

To my all friends and family who have given me support and encouragement over the years. Thank You!

TABLE OF CONTENTS

CHAPTERS

CHAPTER I

INTRODUCTION

Cancer is the second leading cause of death in the United States. A women living in the United States today has a one in eight chance of being diagnosed with breast cancer in her lifetime (NCI, 2009a). It is estimated that 182,460 new cases of invasive breast cancer were diagnosed in 2008 (ACS, 2009b). According to the American Cancer Society, breast cancer continues to be the leading cause of cancer in women and the second leading cause of death for women with cancer.

The Latina/Hispanic sub-population of Americans has a lower incidence of breast cancer but a higher mortality rate from breast cancer. Breast cancer is the leading cause of cancer deaths in Latina women, accounting for 16% of total cancer deaths of Latina women (ACS, 2009a). A Latina/Hispanic woman living in the United States today has a one in 11 chance of being diagnosed with breast cancer or a 40% lower occurrence rate than that of non-Hispanic white women. Despite this lower occurrence, Hispanic women are 20% more likely to die of breast cancer than non-Hispanic white women at a similar age and stage

The treatment of breast cancer is accomplished by separate or combined use of surgery, radiation, biologic therapy, and chemotherapy and/or hormone therapy. Each of these treatments brings side effects that can be physiologically and psychologically long lasting. The most prevalent symptoms observed in cancer patients that endure cancer treatments are fatigue, anxiety, depression, pain,

cachexia, dyspnea, and nausea (Battaglini, Dennehy, Groff, Kirk, and Anton, 2006). The American Cancer Society (2009) reports that fatigue related to cancer treatments is experienced by 72 to 95% of cancer patients that are undergoing or recovering from treatment. The possible factors of this fatigue from cancer treatments are endocrine changes, cardiovascular changes, anemia, pulmonary changes, decreased muscle strength, loss of appetite, disrupted sleep, lack of energy and psychological stress (Battaglini et al., 2006). Depression and fatigue are often associated with cancer survivors but the relationship between these disorders is not clear (Dimeo, Schwartz, Wesel, Voigt and Thiel, 2008). The connection between all of these factors can lead to decreased physical activity levels, leading to diminished capacity to perform even the simplest daily tasks. These symptoms lead to a downward spiral towards further inactivity and increased feelings of fatigue and diminished quality of life for cancer survivors (Battaglini et al., 2006).

Recent studies (Galvao and Newton, 2005; Battaglini et al.; 2006, McNeely, Campbell, Rowe et al., 2006; Valenti, Porzio, Aielli et al., 2008*)* have reported that exercise interventions may enhance quality of life and help to alleviate post-treatment side effects of breast cancer treatment. Exercise is thought to improve psychological and physiological aspects of these side effects, including significant reduction in fatigue, depression, while improving overall quality of life (Battaglini et al., 2006; Dimeo et al., 2008; Holmes, Chen, Feskanich, Kroenke and Colditz, 2005). Most recently, studies have also shown that improvements in physical activity levels not only assist in the mitigation of treatment-related side-effects but have also shown to assist in decreasing the risk for cancer re-occurrence and cancer related death

(Friedenreich and Cust, 2008; Irwin, Smith, McTiernan et al., 2008). Research in the area of breast cancer, physical activity and exercise interventions have primarily focused on white and European subjects (Gilliland, Li, Baumgartner, Crumley and Samet, 2001; Segal, Evans, Johnson et al., 2001), leaving little information on Latina/Hispanic breast cancer patients. Estimates of physical activity for Hispanic women in general suggest that they are less physically active than the overall population of women in the United States (Hughes, Leung and Naus, 2008). Very few studies using exercise as a mean for alleviating cancer treatment-related side effects in Latina/Hispanic women have been conducted to date (Watlington, Byers, Mouchawar, Sauaia and Ellis, 2007; Hughes, Leung and Naus, 2008; Owens, Jackson and Berndt, 2009). These first investigations cited above began the exploration and the development of the body of knowledge on the impact of exercise in the breast cancer Latina population, however they have all used supervised exercise programs, which may not be available to all Latina women. The need to explore a home-based intervention in this population, with the goal of facilitating access to this type of complementary therapy to cancer treatment, and to examine how women respond to regular exercise as part of recovering from breast cancer diagnosis and treatment is paramount.

Statement of Purpose

The purpose of the study was to examine the feasibility of administering a home based exercise intervention to post-treated Latina breast cancer survivors. A secondary purpose was to examine if a relationship exist between changes in

physical activity (PA) levels and changes in depression, fatigue, and quality of life (QOL).

Research Questions

1. Does 8 weeks of participation in the Get REAL and HEEL home-based exercise intervention change overall PA?
2. Is there a relationship between changes in overall PA over 8 weeks of the home-base exercise program and changes in depression?
3. Is there a relationship between changes in overall PA over 8 weeks of the home-base exercise program and changes in fatigue?
4. Is there a relationship between changes in overall PA over 8 weeks of the home-base exercise program and changes in quality of life?

Null Hypothesis

1. Participating in a home-based exercise program will cause no change in overall PA levels over the 8-week home-based program.
2. There will not be a relationship between changes in PA and changes in depression as measured by the CES-D questionnaire.
3. There will not be a relationship between changes in PA and changes in fatigue as measured by the Revised Piper Fatigue Scale questionnaire.
4. There will not be a relationship between changes in PA and changes in quality of life as measured by the FACT-B questionnaire.

Definition of Terms

Accelerometer: a device that measures physical activity levels based on principles of acceleration. Measurements indicate the intensity and quantity of PA.

Depression: measurement of depressive symptoms using the Center for Epidemiological Studies Depression (CES-D) scale.

Fatigue: subjective measurement of the level of weariness or exhaustion due to physical illness using the revised Piper Fatigue Scale.

Overall Physical Activity Level: the amount of daily activity excluding sleep and bathing time, as measured by accelerometer and reported as mean activity counts/minute/day.

Quality of Life (QOL): self-assessed measure of overall enjoyment of life, both physiological and psychological, which includes a person's sense of wellbeing and ability to do the things that are important to them (Cella, 1994). A score for QOL is derived from the Functional Assessment of Cancer Therapy – Breast questionnaire (FACT-B).

Assumptions

- Participants adhered to the home-based exercise protocol.
- Participants accurately filled out all questionnaires measuring depression, fatigue, and quality of life.
- Participants wore an accelerometer for the designated times and followed requirements set out by this study.

Limitations

- Small sample size (n = 7).
- Since the protocol involves a home-based intervention, it was difficult to make sure that participants followed the pre-designed exercise program.
- Some life events (i.e. possible disease complications, family commitments) possibly occurred during the week of data collection for both measurement points (Baseline and at week 8), thus potentially compromising the accuracy of the measurement.
- Even though attempts were made to ensure the participants used the accelerometer every day during the week of data collection for both measurements (baseline and week 8), some days the accelerometer was not worn.
- Data collection occurred during December 2008 – January 2009 holiday season, which may have interfered with performing exercises.
- Type of cancer and treatment may have influenced their weekly participation in physical activity.
- Although all directions were provided in English or Spanish, depending on their primary language, Spanish-speaking women who have questions during the trial may have been hesitant to seek consultation due to perceived language barriers.

Delimitations

- All patients were recruited from the Get REAL and HEEL Breast Cancer Program educational sessions delivered to the Fe, Amor y Esperanza Latina Breast Cancer support group of Wake County, North Carolina.
- All participants were of Latina/Hispanic descent.
- All participants had completed all planned surgery, radiation therapy and chemotherapy.
- All participants were of ages ranging from 26 to 52 years.

Significance of the Study

While there are many studies that report on the benefits of exercise and increases in physical activity (PA) to help decrease the side effects of breast cancer and cancer treatments, very few of these studies are specific to the Latina breast cancer population. Since Latina women have different patterns of diagnosis and disease progression with breast cancer than non-Hispanic white women (ACS, 2009a) and may be less physically active than the overall population of women in the United States (Hughes, Leung and Naus, 2008), investigations specific to Latina women are important to add to the body of knowledge in this area. In the few exercise intervention studies done to date on Latina breast cancer survivors (Hughes, Leung and Naus, 2008; Owens, Jackson and Berndt, 2009), no previous study have attempted to test the feasibility of using a home base exercise intervention with Latina women, this study will bring about new information on the effectiveness of home-based exercise for this population. Since many Latina women may not have access to a gym or specialized breast cancer exercise program due to

socioeconomic and cultural reasons, testing the feasibility of a home-based intervention can be an important way to support increasing exercise and physical activity (PA) in this population.

This study will also enhance our understanding of the possible relationship of changes in PA and changes in depression, fatigue and QOL for Latina breast cancer survivors. Additionally, most studies on breast cancer and exercise intervention have used questionnaires for collecting physical activity levels. While PA questionnaires have been found to be valid instruments, PA can often be under or overestimated by the questionnaires (Ward, Evenson, Vaughn, Rodgers and Trojano, 2005). Through the use of accelerometers, with the goal of increasing objectivity in measurement of PA levels, more knowledge can be gain on the feasibility and efficacy of a home based intervention in this population.

CHAPTER II

LITERATURE REVIEW

This review of literature chapter has been organized into the following sections; breast cancer, breast cancer treatment side-effects, exercise and breast cancer, exercise in the Latina population with breast cancer, and methods of quantifying physical activity levels.

Breast Cancer

According to the American Cancer Society, breast cancer is the top diagnosed cancer for women in the United States when you exclude skin cancers. Breast cancer is the second leading cause of cancers deaths in American women, surpassed only by lung cancer (ACS, 2009b). The odds for women overall of being diagnosed with breast cancer is 1 in 8. The American Cancer Society estimates 182,460 women in the United Stated were diagnosed with breast cancer in 2008; 26% of newly diagnosed cancer in 2008 was breast cancer. Deaths from breast cancer in 2008 were estimated at 40,480, accounting for 15% of cancer deaths in American women (ACS 2009b). The overall 5-year survival rate for 1996-2004 was 88.7% (NCI, 2009a). As of January 2005, there were approximately 2.5 million women alive who had a history of breast cancer in the United States.

For Latina women, breast cancer is also the leading diagnosed cancer (ACS, 2009a). Latina/Hispanic women have a slightly lower risk for diagnosis than women overall, 1 in 11 Latina women may be diagnosed with breast cancer in their lifetime.

However, Hispanic women have a higher risk of death from breast cancer. Breast cancer is the leading cause of cancer deaths in Hispanic women. An estimated 14,300 Hispanic women were diagnosed with breast cancer in 2006 with an estimated 1,740 deaths due to breast cancer (ACS, 2009a).

Hispanic women are less likely to have breast cancer diagnosed at the earliest stages when compared to non-Hispanic white women (ACS, 2009a). Hispanic women with breast cancer present differently than do non-Hispanic White women; differences include diagnosis at an earlier age, in a later stage of the disease, and with larger, higher grade tumors (Watlington et al., 2007). Proposed reasons for these differences have included genetic factors, insurance status, socioeconomic circumstances and access to health care.

Breast Cancer Treatment Side Effects

Surgery is the most common treatment for breast cancer, removing the tumor and surrounding tissue or removing the entire breast. Chemotherapy, radiation and hormone therapy are also used as breast cancer treatments either individually or in combination depending of the desires of the patient and the severity of the disease (NCI, 2008). Although breast cancer treatments have allowed for higher survival rates, many survivors live with side effects from cancer and cancer treatments. These side effects can be severe and long lasting, leading to the inability to function at pre-cancer levels (Battaglini et al., 2006). The most common side effect is fatigue; according the American Cancer Society 70-100% of breast cancer patients will experience fatigue during treatment and 30-50% will experience long-lasting effects. Cancer-related fatigue is experienced as persistent and long lasting, unrelieved by

rest or sleep (Adamsen, Midtgaard, Roerth et al., 2004). Levels of fatigue are associated with higher levels of depression in breast cancer patients (Bower, Ganz, Desmond et al., 2000). Cancer treatment-related fatigue is associated with decreases in physical activity, increases in depression, and decreases in quality of life (Dimeo et al., 2008).

Exercise and Breast Cancer

Exercise has been found to be an effective intervention to improve quality of life, decrease fatigue and depression in breast cancer survivors. McNeely, Campbell, Rowe et al. (2006) reviewed 14 studies on breast cancer and exercise and found that benefits of exercise were positive and led to statistically significant improvements in quality of life. The studies reviewed by McNeely et al., demonstrated significant improvements in physical functioning and reduction of fatigue. Galvao and Newton (2005) reviewed 26 studies on exercise and different cancer types, predominately breast cancer, finding that majority of the studies demonstrated physiological and psychological benefits. These benefits included reduction in depression, fatigue and increases or no change in quality of life. The studies reviewed by Galvao and Newton included cardiovascular training, resistance training, flexibility training or a combination of anyone of the training modes, during and after cancer treatments. Studies reviewed by McNeely et al. also included multiple modes of exercise with the majority including cardiovascular exercise with some including resistance training. Recent studies support the use of both cardiovascular and resistance training to help counteract the side effects of cancer and treatment (Galvao and Newton, 2005).

In a study by Battaglini, Bottaro, Campbell, Novaes and Simao (2004), an inverse and linear relationship, although not significant, was found between fatigue and physical fitness ($r^2 = 0.102$); reduction in fatigue was associated with improvement in physical fitness. Twenty-seven post-treatment female breast cancer survivors participated in a 24-week exercise intervention program using cardiovascular, resistance and flexibility training. Each supervised exercise session included 5 to 10 minutes of stretching, 10 to 20 minutes of aerobic exercise and a resistance-training component. Cardiovascular training was performed at 50-55% of estimated maximal aerobic capacity. Resistance training was performed at 50% of maximal repetition, starting with one set of the exercises for the first four weeks and increasing to two sets in the following weeks.

Kolden, Strauman, Ward et al. (2002) conducted a feasibility study on 40 female in-treatment breast cancer survivors using a 16-week supervised exercise intervention consisting of cardiovascular, resistance and flexibility exercises. The exercise protocol consisted of a warm-up for 10-15 minutes, an aerobic training phase for 20 minutes and a resistance training and cool down phase of 20 minutes. The initial intensity for aerobic exercise was 40-60% of estimated maximum aerobic capacity, which increased to 70% over the 16-week period. Resistance exercises were done with resistance bands, dumbbells and resistance machines. The study found that the exercise was safe and well tolerated yielding significant positive results in aerobic capacity, strength, and flexibility ($p < 0.001$) as well as in selected quality of life scores.

An earlier study by Durak and Lilly (1998) used a supervised cardiovascular, resistance and flexibility training intervention with 20 post-treatment cancer patients. During the 10-week intervention, Durak and Lilly found significant increases in quality of life (functional living, $p < 0.001$; side effects of exercise, $p = 0.001$; pain rating scale, $p < 0.001$), endurance (mins on equipment, $p = 0.04$; MET level, $p = 0.03$) and strength ($p < 0.002$). The exercise program including cardiovascular, resistance and flexibility training was performed twice a week. Cardiovascular training was performed on aerobic machines at the participant's own perceived exertion level for 15-23 min. Resistance training was 2-3 sets of progressive resistance exercises performed on Cybex strength training equipment. Flexibility training consisted of partner and individual stretches as well as breathing exercises and guided imagery. Participants also received one or two 40-min Yoga and advanced movement therapy classes during the 10-week intervention.

Segal, Evans, Johnson et al. (2001) explored the need for supervised versus self-directed exercise for breast cancer survivors in a randomized controlled trial with 123 breast cancer survivors using a 26-week exercise intervention. The women were randomly assigned to either a usual care (control group), self-directed exercise or supervised exercise. The self-directed exercise group received instructions on a five times per week progressive walking program at 50-60% of predicted maximal oxygen uptake. The supervised group exercised three times a week in a supervised setting performing a walking program. The supervised group was also asked to do the walking program at home for at least two other days of the week. In this study, physical functioning decreased in the control group, whereas it increased in the self-

directed and supervised groups (p = 0.04). The largest and most significant difference in physical functioning was between the control and self-directed groups (p = 0.01). No significant difference between groups was observed for changes in QOL. Segal et al. found that self-directed physical exercise was an effective way to increase physical functioning over usual care or a supervised exercise program.

Exercise and Breast Cancer in the Latina Population

One study specific to Latina/Hispanic breast cancer survivors and exercise intervention was found in a complete search of the literature. In 2008, Hughes, Leung and Naus reported a pilot study to test the effectiveness of an exercise intervention with 25 Hispanic breast cancer survivors. The main focus of the study was on the effect of the exercise on stress levels in the intervention participants. The 10-week intervention included cardiovascular, resistance (resistance bands) and flexibility training. Each exercise session was 60-min or less using an individualized exercise prescription. No information was given on frequency of sessions per week. Cardiovascular training was accomplished at unknown intensity, frequency or duration using walking for majority of the participants, stationary cycling for three participants and arm motion exercises for one participant. No detail was given on what resistance band exercises were used and at what intensity except that targeted exercises were repeated 12 times per set. The intervention improved physical fitness as measured by VO_2 (p <0.05), body fat, arm strength, and flexibility (p <0.01). It also reduced perceived stress (p = 0.021), and decreased cortisol levels (p =0.032).

Smith, Alfano, Reeve et al. (2009) recently reported an epidemiological study they conducted on the association between recreational physical activity and QOL in

a multiethnic breast cancer survivor cohort. The study collected data from 448 non-Hispanic White, 197 Black and 84 Hispanic breast cancer survivors. PA was assessed ~2.5 years after breast cancer diagnosis using a modified version of the Modifiable Activity Questionnaire. QOL was assessed six to 12 months later. This study concluded that meeting physical activity recommendations set by American College of Sports Medicine, the American Heart Association and the American Cancer Society was associated with better overall QOL among non-Hispanic White and Black women ($p < 0.05$). In this study Hispanic women did not report better QOL related to PA levels, suggesting that messaging and interventions may need to be structured differently for Hispanic women. Researchers found that interpreting the results for Hispanic women difficult because there were no other studies published on PA and QOL among Hispanic breast cancer survivors.

Methods of Quantifying Physical Activity

In a randomized control trial by Matthews, Wilcox, Hanby et al. (2007), a study subsample of 23 out of 34 post-treated breast cancer survivors in both the usual care and interventions groups, used an accelerometer to quantify changes in physical activity level over a 12-week home-based walking intervention. All of the participants recorded physical activity using a questionnaire. The walking intervention began with three days/week (20-30 min/session) of walking and progressively increased to five days/week (30-40 min/session) by the final five weeks of the intervention at a moderate intensity (RPE 11-13). Average intervention adherence over the 12 weeks was 94%. PA levels significantly increased in invention participants versus usual care ($p = 0.01$) when measured by questionnaire.

Objective measurement by accelerometer also reported significant increases in PA for the intervention participants as compared to the usual care participants ($p = \leq 0.04$). No significant changes were found in body weight or composition. The study reported the questionnaire recorded total activity was positively correlated with the Actigraph accelerometer counts and steps ($rho \geq 0.42$, $p \leq 0.05$).

A randomized controlled study on home based exercise intervention with breast cancer patients by Pinto, Frierson, Rabin, Trunzo and Marcus (2005), used accelerometers to confirm physical activity questionnaire data. Eighty-six post-treatment breast cancer survivors, received 12 weeks of exercise counseling for a home based exercise program. Participants were encouraged to exercise at moderate intensity of 55-65% maximum heart rate using modes such as brisk walking, swimming, biking or use of home exercise equipment. Participants were also encouraged to exercise at least twice a week for at least 10 minutes with a goal to gradually increase duration over the 12 weeks to 30 min of accumulated PA per day on at least five days per week. At the end of the intervention, PA increased significantly versus the control group ($p = 0.001$) as measured by the 7-day PA recall questionnaire (PAR), however measurement using an Caltrac accelerometer did not show a significant change compared to the control. Increases in performance of the PA group versus the control group in a 1-mile walk test ($p = 0.001$) were reported, however body composition and BMI did not change. Researchers attributed the discrepancy in PA levels between the Caltrac and the 7-day PAR to technical difficulties by the participants in wearing the accelerometer and the short wear time of three days.

Accelerometers have been found to provide objective measurement of physical activity levels. In a study by Johnson-Kozlow et al. (2006), physical activity questionnaires International Physical Activity Questionnaire (IPAQ) and the 7-Day Physical Activity Recall (PAR) were validated against an Actigraph accelerometer. Use of the PAR was found to overestimate total PA by 13%. Use of the IPAQ questionnaire significantly overestimated PA by 247% when compared to the accelerometer ($p < 0.001$).

Breast cancer is the top diagnosed cancer in women in the United States and a top cause of cancer deaths. For Latina women, mortality rates are higher than non-Hispanic White women. All breast cancer survivors face side effects such as depression, fatigue and reduced quality of life that may be long lasting. Exercise has been shown to help breast cancer survivors improve these side effects, increasing overall QOL. Increases in overall PA has been associated with reduced risk of cancer re-occurrence and increased QOL. Exercise interventions using cardiovascular, strength and flexibility training are few, however they show positive results to increase PA and QOL. Past studies present positive evidence that increases in overall PA are associated with decreases in depression and fatigue, and with increases in overall QOL. While most studies have been through supervised exercise interventions, home based interventions show promise. Quantification of PA in exercise interventions for breast cancer survivors has typically been measured by self-assessment using questionnaires that can over or underestimate PA levels. Using accelerometry as an objective measurement of PA can help to improve the accuracy of results by removing recall bias.

Latina/Hispanic breast cancer survivors are underserved with respect to research on physical activity, exercise interventions and breast cancer. Most of the research on exercise intervention for breast cancer survivors has been conducted with non-Hispanic White women. As breast cancer presents differently in Latina women and there are cultural differences with respect to exercise and fitness, more research is needed specific to exercise in the Hispanic breast cancer survivor population. With a higher mortality rate for Latina breast cancer survivors and as Hispanics become a larger part of the United States population; more research is being recommended in this area.

CHAPTER III

METHODOLOGY

The purpose of the study was to examine the feasibility of administering a home based exercise intervention to post-treated Latina breast cancer survivors over an 8-week period. A secondary purpose was to examine if a relationship exist between changes in physical activity (PA) levels and changes in depression, fatigue, and quality of life (QOL).

Subjects

Volunteers for this study consisted of 10 females, ages 26 to 52 years old. Volunteers had completed all scheduled surgery, radiation and/or chemotherapy within a range of eight months to eight years at the start of the current study. All patients were recruited from the Get REAL and HEEL Breast Cancer Program educational session that was delivered in Wake County, North Carolina to the Fe, Amor y Esperanza Latina Breast Cancer support group.

Including Criteria

- Women were self-identified as Latino or Hispanic
- Confirmed diagnosis of stage I, II, III invasive breast cancer
- Completion of all planned surgery, radiation therapy and chemotherapy
- Ages ranging from 26 to 52 years
- Patients receiving adjuvant hormonal therapy or adjuvant trastuzumab (such as Herceptin) were also eligible.

Exclusion Criteria

Because of the potential risks involved in any exercise program, if any of the following conditions are present, the individual was not enrolled in the study.

- Cardiovascular, acute or chronic respiratory disease (unless the disease would not compromise the participant's ability to perform in the exercise rehabilitation program);
- Acute or chronic bone, joint, or muscular abnormalities that would compromise the participant's ability to perform in the exercise rehabilitation program as identified on a health risk survey
- Metastatic disease
- Worked third shift

The aforementioned criteria were determined by the assessment of the Physical Activity Readiness Questionnaire (Par-Q), Medical History Questionnaire, and the participant's self-perception on capability of participating in the home-based exercise program.

Recruitment Process

One week prior to a Get REAL and HEEL Breast Cancer Program educational session for Fe, Amor y Esperanza Latina breast cancer support group, the women participating in the seminar received information on the study protocol. They were screened for participation, and then signed a Get REAL and HEEL Breast Cancer approved informed consent from UNC Biomedical IRB. The screening was conducted by a research team member, and consisted of reviewing with the potential participant the inclusion and exclusion criteria for participation, the Par-Q

for the assessment of potential risks for cardiovascular disease, and the medical history questionnaire. If a potential participant were older than 55 years of age, before enrolling in the program, clearance from her oncologist would have been required, following the recommendations of the American College of Sports Medicine.

Instrumentation

Body mass and height were obtained using a Health-o-meter electronic scale (Alsip, IL) and Perspective Enterprises stadiometer (Portage, MI), respectively. Blood pressure was assessed using Diagnostix 700 aneroid sphygmomanometers (Hauppauge, NY) and Litmann stethoscope (St. Paul, MN). Resting heart rate and hemoglobin oxygen saturation was measured after blood pressure measurement using a Sport Stat finger plus oxymeter (Plymouth, MN).

Physical activity was monitored using the Actical activity monitor (Mini Mitter, a Respironics Company, Bend, OR, USA), an omnidirectional accelerometer. The Actical is the smallest accelerometer available (28 × 27 × 10 mm, 17 g) and is water resistant (Pfeiffer, McIver, Dowda, Almedia, and Pate, 2005). The Actical was found by Puyau, Adolph, Vohra, Zakeri and Butte (2004) to strongly correlate to energy expenditure ($r = 0.85$) and Pfieffer et al. (2006) reported the Actical to have a high reliability ($r=0.92$).

Participant self-assessment of depression, fatigue and quality of life questionnaires were collected at the initial meeting with Fe, Amor y Esperanza Latina breast cancer support group during the recruitment session and after the 8th week or participation in the home-based exercise program. Questionnaire scores

were collected and evaluated by the investigator and stored in an electronic database.

Depression was assessed using the Center for Epidemiological Studies questionnaire for depression (CES-D). It is a twenty-item questionnaire with scores ranging from 0-60 with 0 being no depressive symptoms and 60 being the greatest amount of depression that one can experience. The CES-D was found to be a valid and reliable measure of depressive symptomology in breast cancer patients (Hann, Winter and Jacobsen 1999).

The Revised Piper Fatigue Scale is a self-administered questionnaire consisting of 22 questions in 4 subscales: behavioral/severity, affective meaning, sensory, and cognitive/mood. It has been shown to be an effective measurement for assessing fatigue in breast cancer patients (Piper et al.1998). The scores for the Revised Piper Fatigue Scale range from 0-10, with 0 indicating no fatigue and 10 indicating the greatest amount of fatigue possible.

Assessment of quality of life was measured using the Functional Assessment of Cancer Therapy-Breast (FACT-B). FACT-B is a 44 item self-reported instrument designed to measure multidimensional quality of life in breast cancer patients. The dimensions measured in the FACT-B are physical well-being, emotional well-being, social well-being, functional well-being, relationship with doctor, and breast cancer. As reported by Brady et al. (1997), FACT-B demonstrated high reliability with an alpha coefficient of 0.90 and validity was high when compared to other instruments of measuring quality of life in breast cancer patients. The FACT-B scores range from 0-148, with the higher score indicating higher quality of life.

General Procedures

Once the individual is deemed to meet the study criteria, she filled out questionnaires on depression (CES-D), fatigue (Revised Piper Fatigue Scale) and on quality of life (FACT-B). The participant's height and weight was measured and recorded. After the participant sat and rested for approximately 3 minutes, blood pressure, resting heart rate and pulse oxymeter oxygen saturation was measured. An Actical accelerometer was assigned to the participant to wear for one week prior to starting the home-based exercise program with instructions for the use and return of the accelerometer. The participants were instructed to wear the Actical device on the anterior right hip (anterior to the iliac crest) with a waistband clip. Participants were instructed to wear the Actical during waking hours, and to take it off only during bathing and sleeping. When the Actical was returned after being worn for 1-week, data was downloaded using the Actical Software and stored in an electronic database. During the week of obtaining accelerometry data, regular phone calls were made to participants to remind them to use the equipment.

In a meeting one week after the recruitment meeting, a review of the home-based exercise program was conducted with the participant, including the demonstration of resistance and stretching exercises. The participants were asked to perform the home-based exercise for eight weeks and to complete an exercise log (Appendix B). Participants were asked to write down the date, duration, and mode of exercise for each session they perform in the exercise log. Regular weekly contact was made with the participants during the exercise intervention program either by

phone or by email as indicated by the participant's preference for communication method.

At the beginning of the 8th week of the exercise program, an Actical was assigned to wear for one week. During the week of obtaining accelerometry data, regular phone calls were made to participants to remind them to use the equipment. Upon return of the Actical after eight weeks in the exercise intervention, participants were asked to fill out the depression, fatigue and quality of life questionnaires and were measured for weight, blood pressure and pulse oxymeter oxygen saturation. A summary of the timeline for participants is displayed in Table 1.

Table 1. Timeline for Participant's Visits

First Visit – Pre-Intervention Meeting	Second Visit – Educational Seminar	Third Visit – At the start of 8th week of Home-based Exercise program	Final Visit – end of 8th week of Home-based exercise
• Reviewed research study with potential participants • Screened interested breast cancer survivors • Secured Informed Consent • Measured body mass, height, blood pressure, resting heart rate, SpO_2% • BMI computed • Completed FACT-B questionnaire, CES-D and Revised Piper Fatigue Scale • Assigned Actical for 1 week prior to At-home exercise	• Educational seminar on Get REAL & HEEL program • Participants returned Actical • Reviewed home-based exercise program • Home-based exercise began after this visit • Reviewed exercise log • Weekly phone calls or emails to participants to check progress	• Actical assigned for 1 week • Reviewed exercise intervention with participants in a group exercise session • Reviewed any questions on exercise or exercise log • Participants receive CES-D, FACT-B and Revised Piper Fatigue Scale questionnaires	• Return of Actical • Return of exercise log • Return completed, CES-D, FACT-B questionnaire and Revised Piper Fatigue Scale • Measured body mass, height, blood pressure, resting heart rate, SpO_2% • BMI computed

Home-Based Exercise Program

Participants were given instructions on exercise guidelines and example exercises for the home-based program (Appendix A) during the Get REAL and HEEL educational session. The 5-month Get REAL and HEEL (Get Recreation –Get Exercise – Get Active –Get Living) program is an individualized prescriptive exercise and recreational therapy program for post-treatment breast cancer patients in N.C., administered at the Get REAL and HEEL facility located at the University of North

Carolina at Chapel Hill, Department of Exercise and Sport Science. Since not all post-treated breast cancer patient have access to the Get REAL and HEEL facility because of transportation issues, work and family obligations, and geographic location (too far to commute) a community based program was developed by Get REAL and HEEL to provide access to an exercise intervention that can be performed at home. The educational session presents both exercise and recreational therapy techniques. A technique for stress and negative emotion management called HeartMath® is taught at the education session prior to the presentation of the exercise program. The exercise protocol consists of cardiovascular exercise, resistance training and stretching; a summary of the exercise intervention is displayed in Table 2. The participants were asked to adhere to the exercise program for eight weeks. During the eight weeks home based program, participants were instructed to start the exercise training program two times per week for at least 30 minutes per session, which the minutes per exercise session could be spread throughout the day (i.e: 15 minutes in the morning + 15 minutes in the afternoon). During the first two weeks of training, participants were instructed to start increasing the duration of the exercise session until they could complete one hour of exercise two times per week. After the one hour exercise session was achieved two time per week, participants were all instructed to add a third session and maintain a one hour, three times per week training regimen for the remainder of the study. For the cardiovascular portion of the exercise prescription, participants were instructed to exercise between 2-5 times per week (starting at 2

times per week and progressing to a 5 times per week) for a total of 30-60 minutes per session.

Table 2. Get REAL and HEEL Home-Based Exercise Guidelines

Type of Exercise	Frequency	Intensity	Duration and Progression	Mode
Cardiovascular	2 – 5 Sessions/week	Light to moderate; RPE of 2 – 5 (modified Borg scale of 1 – 10)	20-30 minutes (continuous or in multiple sessions of at least 10 mins throughout the day)	Aerobic, rhythmic using large muscle group, examples are walking, cycling, running and swimming
Resistance	2 – 3X /wk	Light to moderate; RPE of 2 – 5 (modified Borg scale of 1 – 10)	7-8 exercises for the whole body, large muscle groups	Resistance bands and body weight resistance exercises
Flexibility	At least 2 – 3X/wk if not everyday	Hold stretch for comfortable tension that should subside as you hold it	Hold each stretch for 10 – 15 sec	Sequence of 8 stretches for whole body

Data Analysis

Data collected from accelerometers was reduced using Microsoft Excel 2008 for MAC. Periods of non-wear and erroneous data were identified and removed following NIH procedures used for NHANES data (NCI, 2009b). A valid day of wear is when the participant wore it for at least 10 hours with periods of 30 minutes of inactivity considered non-wear. Data from accelerometers was reviewed in activity counts of average counts/minute/day. Change scores were computed for baseline to

8-weeks of intervention from activity count data, FACT-B, CES-D and Revised Piper Fatigue Scale scores. Statistical software, SPSS version 16.0 for Windows, was used for the analyses of the data.

H1: There will be no difference between overall physical activity levels measured by accelerometry for 1-week pre-intervention and at week 8 of participation in the program. Hypothesis one was analyzed by paired t-tests. The scores obtained for the assessment of physical activity in average counts/min/day at baseline and at week 8 were used for the analysis.

H2: There will not be a relationship between changes in Overall PA and changes in depression as measured by the CES-D questionnaire. Hypothesis two was analyzed by Spearman rank order correlation analysis comparing changes in overall PA (average counts/min/day) with changes in fatigue scores. Delta scores (Post-exercise intervention scores minus scores obtained prior to home-based exercise intervention) were used for the analyses.

H3: There will not be a relationship between changes in Overall PA and changes in fatigue as measured by the Revised Piper Fatigue Scale. Hypothesis three was analyzed by Spearman rank order correlation analysis comparing changes in overall PA (average counts/min/day) with changes in fatigue scores. Delta scores (Post-exercise intervention scores minus scores obtained prior to home-based exercise intervention) were used for the analyses.

H4: There will not be a relationship between changes in Overall PA and changes in quality of life as measured by the FACT-B questionnaire. Hypothesis 4 was analyzed by Spearman rank order correlation analysis comparing changes in overall PA

(average counts/min/day) with changes in QOL scores. Delta scores (Post-exercise intervention scores minus scores obtained prior to home-based exercise intervention) were used for the analyses.

CHAPTER IV

RESULTS

The purpose of the study was to examine the feasibility of administering a home based exercise intervention to post-treated Latina breast cancer survivors over an 8-week period. A secondary purpose was to examine if a relationship exist between changes in physical activity (PA) levels and changes in depression, fatigue, and quality of life (QOL). All data were entered into an electronic database for analysis. All data were analyzed using SPSS version 16.0 for Windows, a statistical software program. An alpha level of 0.05 was used for all statistical procedures. Since recruitment, two participants were dropped from the study for medical reasons, and one participant lost an accelerometer at the end of the study, thus compromising the data collection to be performed at a pre-determined timeline for the study. Therefore all analyses were performed on seven subjects.

Subjects

Seven Latina women post-treated for breast cancer with ages ranging from 26 to 52 years old ($\bar{x}$=43) participated in the study. Participants' height was 154.0 cm (*SD* = 5.3) with body weight relatively unchanged pre-intervention ($\bar{x}$ = 68.9 kg, *SD* = 12.9) versus post-intervention ($\bar{x}$ = 69.4 kg, *SD* = 12.9). BMI was also unchanged by the exercise intervention ($\bar{x}$ = 29, SD = 5). Blood pressure was slightly lower after the intervention; pre-intervention mean systolic blood pressure was 122 mmHg (*SD* = 12) and diastolic blood pressure was 75 mmHg (*SD* = 12)

compared to post-intervention mean systolic blood pressure of 120 mmHg (*SD* = 8) and diastolic blood pressure was 70 mmHg (*SD* = 9). Resting heart race decreased from pre-intervention ($\bar{x}$ = 81 bpm, *SD* = 13) to after the intervention ($\bar{x}$ = 71 bpm, *SD* = 11).

Psychosocial Questionnaire Results

Mean overall score for the CES-D questionnaire for depression pre-intervention was 13 (*SD* = 8), with a post intervention score mean of 6 (*SD* = 2). The mean scores for the Revised Piper Fatigue Scale pre- and post-intervention was 3.7 (*SD* = 2.4) and 2.1 (*SD* = 1.5), respectively. For QOL measurement using the FACT-B questionnaire, mean scores were 105 (*SD* = 29) prior to the exercise intervention and 108 (*SD* = 22) after the intervention.

Hypothesis One

Hypothesis one, there will be no change in overall physical activity levels over the 8 week home-based exercise program, was analyzed using a paired sample t-test. The scores used for the analyses included the average activity counts per minutes per day obtained at baseline and during week 8 of the exercise intervention.

No significant difference (mean diff = 8.257, t = 0.427, df = 6, 95%, CI -39.071 to 55.585, *p* = 0.684) was observed in overall PA between scores obtained at baseline ($\bar{x}$ = 152 counts/min/d, *SD* = 77) and post-intervention ($\bar{x}$ = 144 counts/min/d, *SD* = 44).

Hypothesis Two

Hypothesis two, there will be no relationship between changes in overall PA and change in depression scores, was analyzed using a Spearman *rho* correlation. The delta scores (post-exercise intervention score – baseline scores) for both variables were used for the analyses. No significant correlation was found (*rho*(7) = -0.709, *p* = 0.074). See Figure 1 for scatter plot of changes in overall PA related to changes in depression scores.

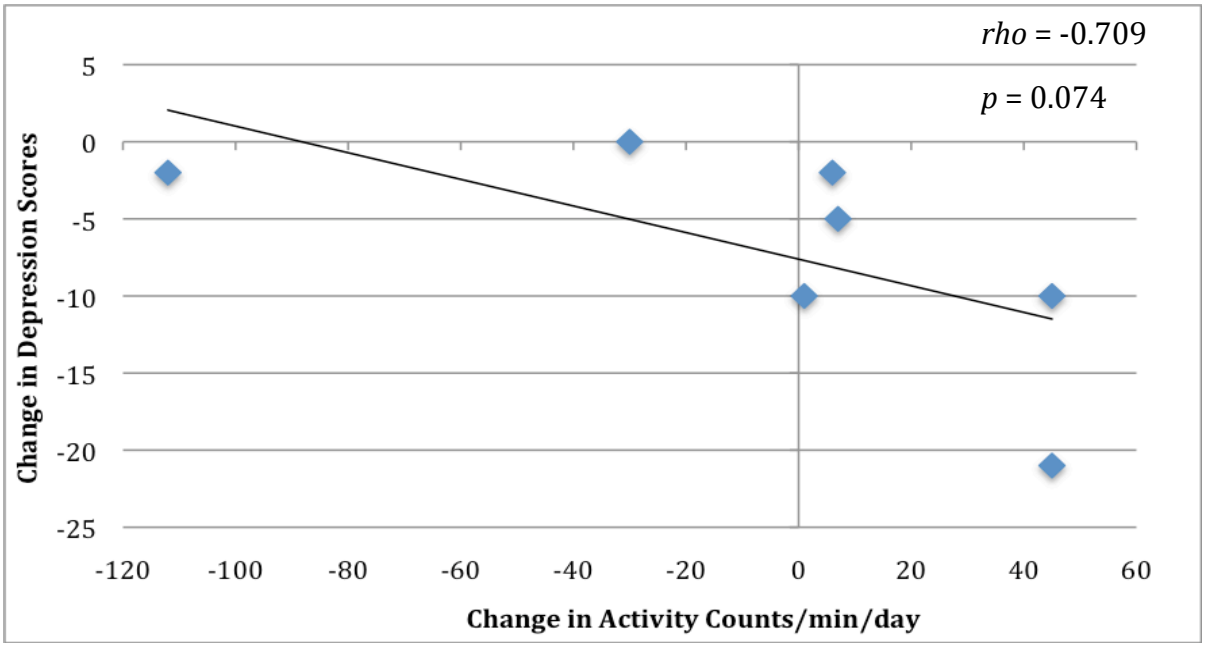


Figure 1. The scatter plot for the Spearman correlation between changes in overall PA and depression over the 8-week intervention.

Hypothesis Three

Hypothesis three, there will be no relationship between changes in overall PA and change in fatigue scores, was analyzed using a Spearman *rho* correlation. The delta scores (post-exercise intervention score – baseline scores) for both variables

were used for the analyses. No significant correlation was found (*rho*(7) = -0.500, *p* = 0.253). See Figure 2 for scatter plot of changes in overall PA related to changes in fatigue scores.

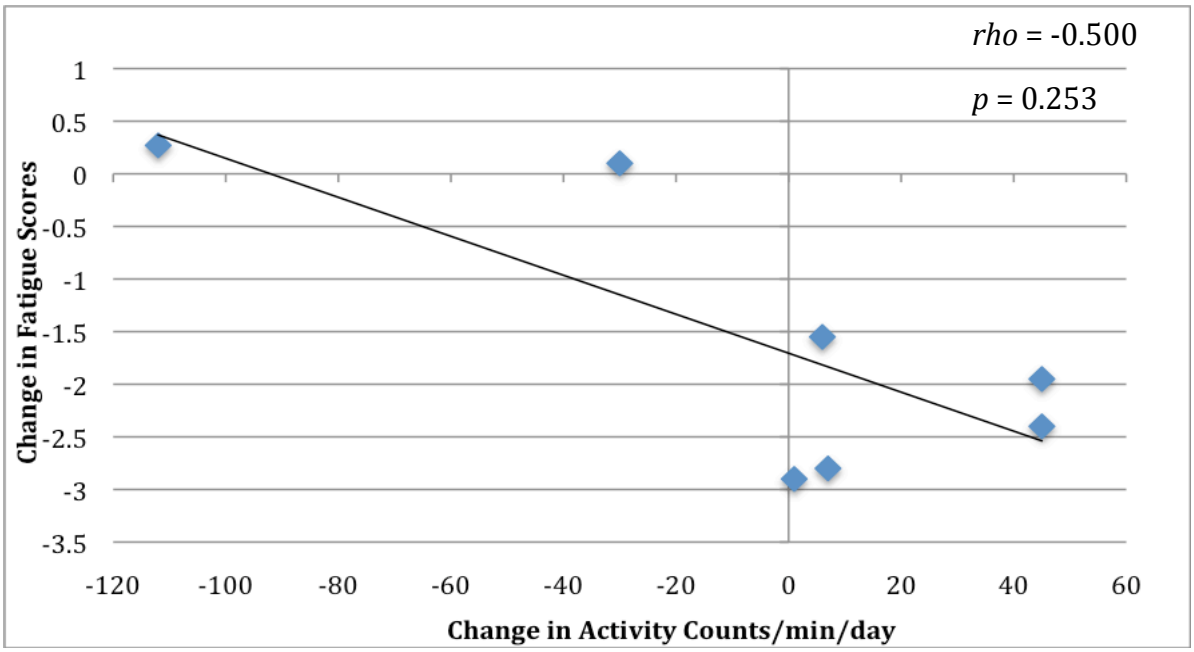


Figure 2. The scatter plot for the Spearman correlation between changes in overall PA and fatigue over the 8-week intervention.

Hypothesis Four

Hypothesis 4, there will be no relationship between changes in overall PA and change in QOL scores, was analyzed using a Spearman *rho* correlation. The delta scores (post-exercise intervention score – baseline scores) for both variables were used for the analyses. A significant positive relationship was found between change in overall PA and change in QOL scores (*rho*(7) = 0.870, *p* = 0.024). See Figure 3 for scatter plot of changes in overall PA related to changes in overall QOL scores.

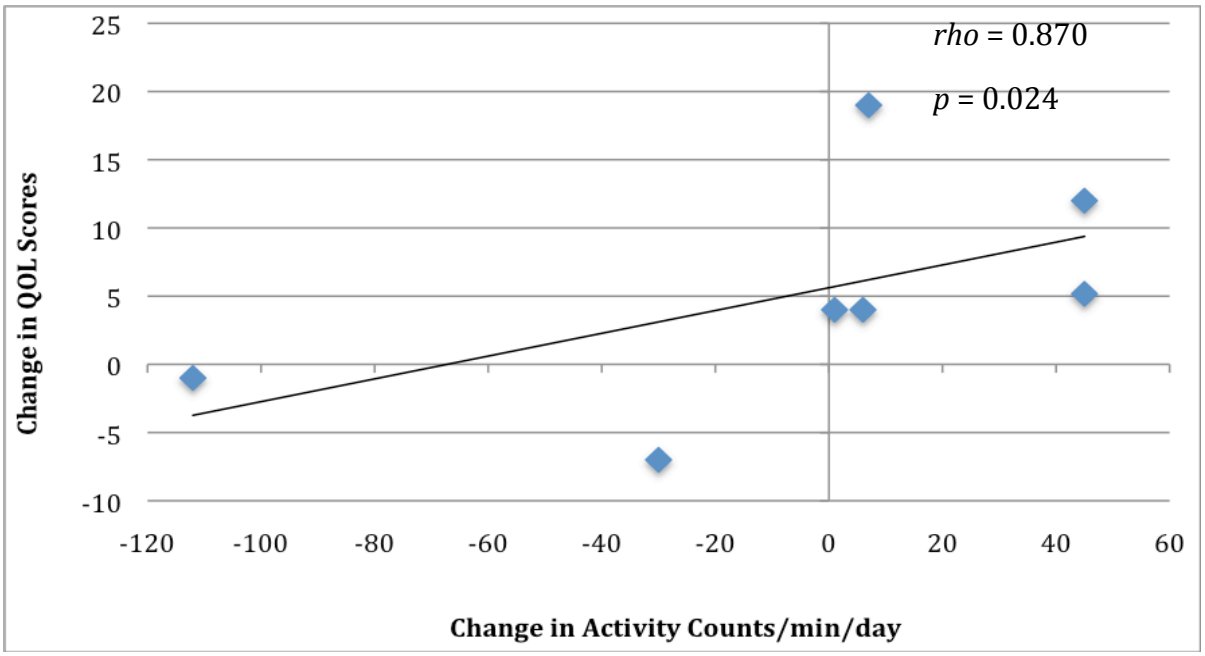


Figure 3. The scatter plot for the Spearman correlation between changes in overall PA and QOL over the 8-week intervention.

CHAPTER V

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

The purpose of the study was to examine the feasibility of administering a home-based exercise intervention to post-treated Latina breast cancer survivors, to understand the practical aspects of adherence and execution of the intervention. A secondary purpose was to examine if a relationship exist between changes in physical activity (PA) levels and changes in depression, fatigue, and quality of life (QOL). It is important to understand the effects of a exercise intervention on physical activity since increases in PA in breast cancer patients has been shown to decrease risk for cancer, decrease the side effects from cancer and treatments and improve quality of life.

Feasibility of a Home-Based Exercise Intervention

The results of the present study provide useful preliminary information for Latina breast cancer survivors on the feasibility of a home-based exercise intervention. All of the participants in the study were able to initiate or maintain an exercise routine during the course of the 8-week intervention. We were able to observe promising trends in improvements in depression, fatigue and quality of life (QOL) related to increases in physical activity. However not all of the participants progressed in volume and frequency of exercise as was envisioned for this study. In the current study, frequency ranged from one to five times a week as recorded in exercise logs and through follow up phone calls. About half of the participants

exercised twice a week during the entire intervention, therefore they did not follow the recommended progression. The instructions given to participants at the beginning of the exercise intervention was to increase duration and frequency of exercise as they felt stronger without specific milestones, starting at two sessions per week for a duration of 20-30 min per session. We envisioned that participants would progress to three sessions per week or greater by the end of the study period. Actual duration for each cardiovascular training session in the present study ranged from 15 – 30 minutes as recorded in the exercise logs. Intensity in the current study was prescribed at light to moderate intensity (RPE 11 – 13) and indications from accelerometer data collected is that intensity of participants' exercise was light to moderate intensity with most participants intensity level was towards light intensity.

Overall exercise program adherence was inconsistent in frequency of sessions per week and duration when comparing participants, however all of the participants recorded regular exercise during the intervention. Two participants did not keep an exercise log and it was difficult to verify activity but when the participants were questioned, one reported doing the cardiovascular component of the intervention twice a week and the other reported doing the total exercise intervention routine at least twice a week. The exercise intervention ran through the Christmas season at the of the year, and could be possible that some of the participants may have lost momentum in their progression of exercise training.

Adherence and non-progression could also be attributed to lifestyle and cultural factors such as longer work hours and balancing work with family obligations. Latina women engage in higher levels of household/domestic activity,

they may believe they are getting enough exercise, thus promoting additional exercise may be difficult (Marquez and McAuley, 2006). Interestingly, one of the participants did record housecleaning for one of their exercise session in their exercise log. For Latina women the concept of “leisure time”, a time without responsibility to anyone or anything does not exist. Latinas are highly family oriented, putting family first before anything. One potentially successful method for increasing exercise behavior is to target family health; interventions that target the family as a unit for increasing PA have been successful (Marquez and McAuley, 2006). It is important to address the importance of family within this American subgroup. Typically Latina women work longer hours at occupations as well as engaging in domestic activities. This leaves little time to dedicate to exercise. Because of this high level of domestic and occupational time, increasing the frequency of training per week can be perceived as less family time (Marquez and McAuley, 2006) and therefore one of the possible reasons for the non progression in training observed in this study.

Adherence and non-progression in the exercise intervention could also be attributed to the method in which instruction was given and follow-up was done. At the Get REAL and HEEL educational session, instructions and demonstrations for exercise were given in Spanish to the group as a whole. It was emphasized that for frequency and intensity that it should start at two times per week at a low intensity. The participants were also instructed that as they feel stronger they should increased duration first, then frequency, then intensity. No further instructions were given beyond the first session unless questions were asked during follow up phone

calls and emails. Perhaps if the participants had received more guidance on an individual basis before and during the intervention, as was done in previous home-based exercise intervention studies with breast cancer survivors (Matthews et al., 2007; Pinto et al., 2005), the participants may have increased the frequency and length of exercise sessions over the intervention period. In the previous studies on home based exercise for breast cancer survivor, where a clear scheduled progression was given to participants and exercise counseling was done on a regular basis, participants did increase exercise through the exercise intervention timeframe. Also, group sessions that involve family may be beneficial for motivation since this would support the Latina culture of family first and the strong social network they value.

Language may have also been a factor during the exercise intervention and for reporting of psychosocial results. Of the seven participants that completed the study, 60% reported that Spanish was their primary language. Initial instructions were given in Spanish and reference materials on resistance and stretching exercises were translated to Spanish. Even though all attempts were made to clearly instruct all participants regarding the study protocol, including in-depth explanations of the home based exercise prescription, the language barrier and the nature of some question associated with the psychosocial measurements used in the study, may not have been clearly communicated with the participants. The possibility of critical information regarding the study design and intervention may have been lost in translation during the study which could have accounted for the

non-increment in the prescribed dosage of the exercise program observed in the study.

A home-based exercise intervention for Latina breast cancer survivors shows promise and needs further investigation. Given attention to how the instructions for the exercise intervention were given, how follow-up is done during the intervention, consideration for social and cultural aspects of Latina women, such as the inclusion of family members or social groups in the design of the intervention, and in how the exercise intervention parameters are set and communicated, home-based exercise for Latina women appears to be feasible to help with increasing physical activity levels and therefore the results of this study warrants further investigation.

Physical Activity in Post-Treated Latina Women with Breast Cancer

Hypothesis one assessed levels of physical activity before and during the last week of participation in an 8-week home based exercise intervention. The current study confirmed the null hypothesis and found no difference between overall physical activity levels measured by accelerometry for 1-week pre-intervention and at week 8 of participation in the program. Past studies on the role of exercise with cancer patients have linked increases in PA with positive effects on decreasing fatigue, enhancing physical performance, and improving quality of life (Galvao and Newton, 2005). Thus understanding if an exercise intervention invokes increases in PA is key to knowing if the intervention will promote the beneficial changes in physiological and psychosocial parameters for cancer patients. Only a small number of past cancer exercise intervention studies reported overall PA changes as a key outcome parameter. Previous research has reported significant increases in PA from

an exercise intervention with cancer patients but some disparity is seen in results due to measurement methods (questionnaire vs. accelerometer).

A study conducted by Matthews et al. (2007) explored PA changes from a 12-week home-based walking program. Twenty-three post-treatment breast cancer survivors participated in the walking program; thirteen other breast cancer survivors were assigned to a wait-listed usual care group. Overall PA (counts per minutes per day (ct/min/d)) was significantly higher for the intervention group compared to the control (p = 0.01) when measured using an accelerometer. When PA was assessed by self-reported questionnaires, total PA was increased over the control group but at a non-significant level (p = 0.10). However, significantly greater time was allocated to walking exercise as measured by self-assessed questionnaire for the intervention group versus the control group (p = 0.01). Results were not reported for within group changes, therefore it is difficult to compare the current study to Matthews' study but Matthews' study does show that a home-based exercise intervention can increase PA.

In a study by Pinto et al. (2005) contrasting results were found when compared to Matthew's study, significant increases in overall PA were reported for the intervention group versus the control group when measured by a 7-day PA recall questionnaire (p = 0.001). However, when overall PA was measured in Pinto's study with an accelerometer, changes were not seen in overall PA. Eighty-six post-treatment breast cancer survivors followed a 12-week home-based exercise intervention. The program consisted of cardiovascular training using exercise of the participant's choice (walking, biking, swimming, home exercise equipment) at 55-

65% maximum heart rate. Frequency of exercise sessions were initially twice a week for at least 10 minutes with a goal of reaching five days per week over the 12 weeks of the intervention. Consistent with the current study, no change in overall PA was seen when measured with an accelerometer. The study's authors attributed the difference in PA measurement to participant difficulties in using the accelerometer and with a short time the accelerometer was used for assessment (3 days).

Although the current study did not report significant changes in overall PA, the study by Matthews et al (2007) did confirm that an home based exercise intervention can be effective at increasing PA levels and that those increases can be measured using an accelerometer. Matthews et al. study prescribed aerobic exercise of walking at higher frequency and duration than the current study, starting at three times per week (20-30 min/session) and increasing to five times a week (30-40 min/session). In the current study, most participants recorded doing cardiovascular exercise one to three times a week during the final week when they were wearing the accelerometer, with duration for each session ranging from 15 – 30 minutes. As was previously discussed, participants in the current study did not increase in frequency and duration as seen in the Matthews' and Pinto's studies. Intensity of aerobic exercise was similar between the present study and Matthews' study. The lower frequency and duration of aerobic exercise in the current study when compared with similar studies could explain why significant changes were not seen in overall PA from baseline to post-intervention. The present study also included resistance and flexibility training which Matthews' study did not. Although the current study did include additional exercise with resistance and flexibility training, any

increase in PA from resistance training and stretching were likely not measured by accelerometry due to the inability of accelerometers to record movement that is not dynamic in nature.

Adherence to the home-based exercise program could also be a factor in reporting no change in PA in this current study. Several measures were taken in the current study to increase adherence to the intervention during both the two weeks of measurement using the accelerometer and for all 8-weeks of the intervention. When wearing the accelerometer, phones call and/or emails two to three times per week were made to the participants to check if they were wearing the Actical accelerometer and if they had any questions on exercise. During the exercise intervention contact was made on a semi-weekly basis (average contact of once every other week) to participants to ask about compliance to the exercise intervention and to answer any questions. Compliance during the measurement weeks was excellent with only one of the seven participants not wearing the Actical for five or more days. As previously mentioned, overall exercise program adherence was inconsistent in frequency of sessions per week and duration when comparing participants, however all of the participants recorded regular exercise during the intervention.

Although accelerometers are more objective measurement instruments, they still have limitations. Overall PA measured during the last week of the intervention, for some of the participants, was lower in activity level when compared with other weeks as recorded in the exercise logs thus may not accurately capture their overall PA level or increases in PA throughout the entire 8-week intervention. The

participant's exercise logs did closely relate to the accelerometer data, validating the accelerometer data; for example where a participant's exercise log reported lower exercise pre- versus post-intervention the accelerometer data also reflected this change. Therefore the accelerometer appeared to be valid when compared with the exercise logs but the specific week that was measured may not have reflected the true changes in activity levels if a participant did not have a week truly reflective of their normal exercise pattern. Another limitation of the accelerometer measurement is the recording of activity that is non-dynamic in nature. A substantial portion of the current study intervention was resistance and flexibility training that is more static in nature, therefore although resistance and flexibility training induced an increase in PA, the accelerometer would not show substantial increased overall activity counts (Matthews, 2005). Due to the intervention type and intensity in the current study, the amount of activity counts recorded were not enough to register a significant change.

The non-significant findings could also be due to the small sample size (n = 7). However, for five of seven participants in this study, increases were reported in overall PA. Previous research showed positive increases in PA from home based interventions (Matthews et al., 2007; Pinto et al., 2005), therefore it can be expected that given the appropriate exercise prescription, attention to social and cultural aspects of Hispanics and adjustments to study methods, increases in PA from an home based intervention are highly possible and feasible.

Physical Activity Levels and Depression

Hypothesis two examined the relationship of changes in overall PA levels and changes in depression. Results confirmed the null hypothesis, no significant

correlation was found (*rho*(7) = -0.709, *p* = 0.074), although a positive trend was observed showing increases in PA may cause decreases in depression. A reason for the non-significant result could be from the small sample size of the present study, which can decrease statistical power. Previous research has shown that an exercise intervention can decrease feelings of depression in cancer survivors while other studies have not show a relationship. Segar et al. (1998) reported the exercise group had significant decreases in depression compared to the control group from a 10-week exercise intervention. Twenty-four breast cancer survivors performed 30-40 minutes of cardiovascular exercise four times a week. In another study done by Porock, Kristianson, Tinnelly, Duke and Blight (2000), a 4-week home-based exercise intervention with cancer patients post-treatment showed positive changes for depression. The intervention in this study appears to have included cardiovascular and resistance training but details of the intensity and frequency of the exercise were not available. According to previous research, if the change in PA in the current study had been significant it may have been possible to influence depression in a significant positive direction.

In a study by Courneya et al. (2003) that compared a 10-week home based exercise and group psychotherapy (GP) alone or in combination, the authors concluded that a home-based moderate intensity exercise program might improve QOL beyond the benefits of GP, particularly with physical and functional well-being. However they did not find significant changes in depression as well as other emotional and social well-being parameters when comparing GP and exercise only groups. The authors wrote that GP alone was sufficient to improve anxiety and

emotional well-being and that perhaps it was unreasonable to expect exercise to provide further improvements. Results of the current study are supported by Courneya's study in that QOL improved with the exercise intervention but not depression but it is difficult to compare results directly as comparisons were not within group changes but between group changes for GP and exercise groups.

Physical Activity Levels and Fatigue

Hypothesis three examined the relationship of changes in overall PA and changes in fatigue. No significant correlation what found ($rho(7) = -0.500$, $p = 0.253$). Again, a reason for the non-significant result could be from the small sample size of the present study, which can decrease statistical power. However, a positive trend was observed in the data where increases in PA may promote decreases in fatigue.

In majority of the previous post-treatment cancer exercise intervention studies with fatigue as a key outcome, fatigue was seen to decrease after an exercise intervention (McNeely et al., 2006; Galvao and Newton, 2005; Dimeo et al., 2008). When Pinto et al. conducted a 12-week home-based exercise intervention with 86 breast cancer patients, they found that physical activity increased as well as fatigue decreased significantly. Exercise participants reported lower fatigue than in the control group. The exercise program in Pinto's study was an aerobic based program with initial frequency of exercise set at two sessions per week then increased to five times a week (30 min/session) by the end of the intervention. In the present study, the amount and intensity of exercise may have been too low to promote changes in fatigue.

In a more recent study by Dimeo et al in 2008, thirty-two post-treatment cancer patients participated in a 3-week aerobic and resistance-training program. This study reported physical performance (workload at anaerobic threshold) increased significantly and mental and physical fatigue decreased significantly ($p < 0.0001$). However, depression and cognitive fatigue was unchanged. The authors suggest that although cancer-related fatigue and depression are closely related, this study showed that different therapeutic approaches might be needed to address cancer-related depression and fatigue.

In the current study, a positive trend was observed in the data where increases in PA may promote decreases in fatigue. As suggested by previous research, if the current study's home-based intervention promoted significant increases in participant's overall PA, decreases in fatigue may have been more strongly correlated to the changes in PA. Cancer-related fatigue has several aspects such as physical, cognitive, mental and volitional. It is possible that the exercise intervention in the current study could have addressed some of the psychological aspects of fatigue through the motivation, social interaction and expectations from being in the trial, thus leading to the positive trend of improvement seen. However, this is only speculative at the moment, and a larger trial is needed to confirm or refute this possibility. In past studies a placebo effect has been seen from the interaction and attention that come from being in a study (Dimeo et al. 2008).

Physical Activity Levels and Quality of Life

Hypothesis four addressed the relationship between changes in overall PA and changes in QOL. Significant positive correlation was found between changes in overall PA and changes in QOL scores ($rho(7) = 0.870$, $p = 0.024$). These findings are in agreement with many previous studies that report exercise interventions for cancer survivors increase QOL. Quality of life is multidimensional with both physical and psychological aspects. Physical and functional well-being are essential components of QOL and if there is a decrease in physical and functional well-being, in some part, this maybe a contributing factor to mental distress encountered by cancer survivors (Courneya et al. 2003). There is now consistent and substantial evidence that exercise interventions with cancer survivors can improve physical functioning and address cancer treatment side effects including psychosocial aspects (Courneya et al. 2003; McNeely et al. 2006; Galvao and Newton, 2007). Exercise interventions in cancer survivors have reported improvements in cardiovascular capacity and endurance, muscle strength and endurance, flexibility, body composition, fatigue, depression, sense of control and treatment side effects. Functional well-being may be the most significant area in need of improvement for cancer survivors and the most important dimension for improvements in QOL (Courneya et al. 2003). Therefore, promoting exercise and increases in PA that improve physical and functional well-being is important in cancer survivors to increase QOL.

Only one exercise intervention study specific to Latina breast cancer survivors was found in a literature review; it was conducted by Hughes et al. (2008), where

they examined aspects of quality of life. The authors measured perceived physical and mental functioning as components of QOL using the Medical Outcomes Study Short Form-36 questionnaire. While the exercise intervention improved all physical fitness parameters significantly, results for QOL parameters were non-significant due to the non-significant changes by participants' scores on perceived physical functioning and metal functioning. Hughes' study reported a trend toward linear improvements in perceived physical functioning scores that approached significance (p = 0.112). For mental functioning, this study reported non-significant results (p = 0.311). Consistent with the current study, Hughes' study was conducted as a pilot study since as was no control group and a small sample size (n = 25). It is difficult to compare the current study to Hughes' results since reported outcome parameters were different; in Hughes' experiment PA was not measured nor correlated to QOL parameters.

In the current study, a significant positive relationship was observed between changes in quality of life scores as measured by FACT-B and changes in physical activity. Despite the non-significant changes in PA reported in the current study, the home-based exercise program did encourage increased perceptions of QOL. Where two study participants did showed a decrease in overall PA, QOL scores declined as well while all other participants increased in PA and QOL, showing a strong relationship with exercise and QOL that has been demonstrated in other cancer exercise intervention studies (Courneya et al., 2003; McNeely et al. 2006; Galvao and Newton, 2007).

In addition to the exercise program used by participants from the Get REAL and HEEL educational session, the participants were also instructed on the HeartMath® technique to manage stress and negative emotion. This stress management technique may impact quality of life and thus may explain that while PA did not change from the intervention QOL showed increased scores for the group overall. The feeling of control from exercising that studies have reported may also contribute to increases in QOL seen in the study. Specific to the breast cancer support group in the current study, anecdotally participants reported that they felt Latina breast cancer survivors lacked support from the medical and research communities, and this attention from our research team may have contributed to the increased feelings of support that could influence QOL scores.

Conclusion

The results of this feasibility study suggest that a two-to-three day per week home-based exercise intervention did not improve the overall amount of physical activity in Latina breast cancer survivors. The small sample size, the amount and intensity of exercise, the time of the year the study was administered (end of the year holidays) and the intervention design where resistance and flexibility exercise may not have registered increased PA on the accelerometer, may have hindered the possibility for significant changes to be observed. However, the intervention in this study showed trends towards reductions in fatigue and depression, while improving overall quality of life.

Recommendations for Future Studies

Based on what was learned from the current feasibility study, the following are recommendations for future research that will examine the impact of home-based exercise interventions for Latina breast cancer survivors, particularly in regards to the study a home-based intervention and its influence on physical activity levels, depression, fatigue and quality of life.

1. Larger sample size to increase statistical power.
2. Increase the frequency of sessions for the home-based exercise intervention to three or more sessions per week since previous studies on exercise with breast cancer survivors showed increases in PA when using 3 sessions/wk or greater.
3. Emphasize the training progression to participants; what is expected in frequency, duration and intensity with specific milestones. Without specific guidance on progression in the present study, some participants did not increase the amount of exercise per week over the course of the 8-week intervention, potentially inhibiting increases in PA.
4. Meet individually with each participant to review the exercise plan and expectations on content in exercise logs, to ensure comprehension on the details of the exercise plan, progression and expectations of the participant on recording information. A review of the exercise plan and progression, helping participants to perform the proper amount and type of exercise that will promote beneficial changes. By reviewing

exercise log requirements; this could help to provide more useful and uniform information in the exercise logs for comparisons with the accelerometer data.

5. Continue to use of an exercise log; in the present study the exercise log provided valuable information to compare and validate the results of the accelerometer data collection.
6. Add wait-listed usual care group as a control group to provide a comparison on if changes in PA, depression, fatigue and QOL are due to normal usual care or from the exercise intervention.
7. For accelerometer wear, use belts that fasten securely rather than waistband clips as this can help to reduce lost accelerometers. Emphasize the importance of wearing the accelerometer for a required number of days or the data will not be usable. Have contingency plans for participants that are not able to make group collection point sessions so that no data is lost.
8. Lastly but not least, extremely important for the design of future experiments in the Latina population, is to make sure adjustments to the exercise interventions that incorporate the Latina culture of family and social network should be considered. Community based exercise programs that include family and support groups may be used as a strategy to complement the home-based exercise prescription. This will help to address the high value that Latina women place on family and

social support perhaps allowing for greater motivation to perform exercise more regularly.

Appendix A

Home-Based Exercise Reference Sheet
(The Spanish version of Appendix A, was given to participants)

Get REAL & HEEL

Exercise Session Example

(Get REAL & HEEL Breast Cancer Program)

Sequence # 1 (Whole Body Stretch)

1. Neck (Hold 10-15 sec each side)

2. (Hold stretch 10-15sec)

3. Chest/ Shoulder (Hold stretch 10-15 each side)

4. Back (Hold stretch 10-15 sec)

5. Scapula (Hold stretch 10-15 sec) 	6. Quads (Hold stretch 10-15 sec) 
7. Hamstrings (Hold 10-15 sec each leg) 	8. Calves (Hold 10-15 sec each leg) 

Sequence # 2 (Weight Training Exercises)

1. Shoulder (Lateral Raises 1-3 sets / 12 repetitions)

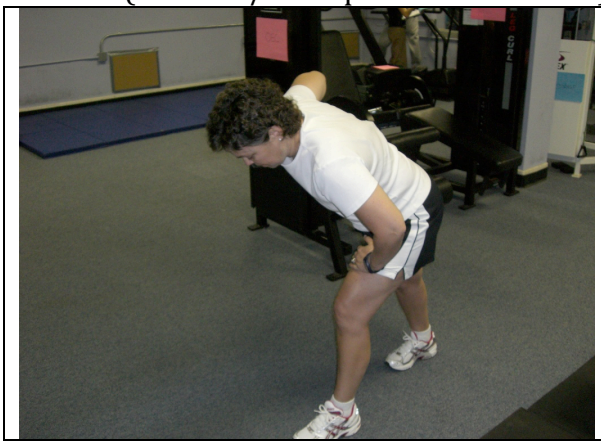
2a. Chest (Level 1)

2b. Chest (Level 2)

2c. Chest (Level 3)

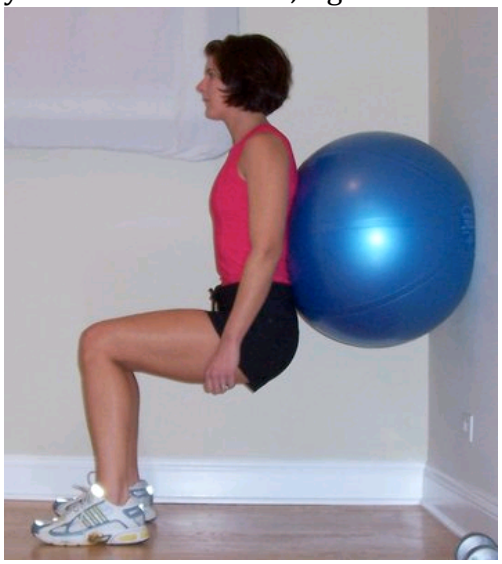
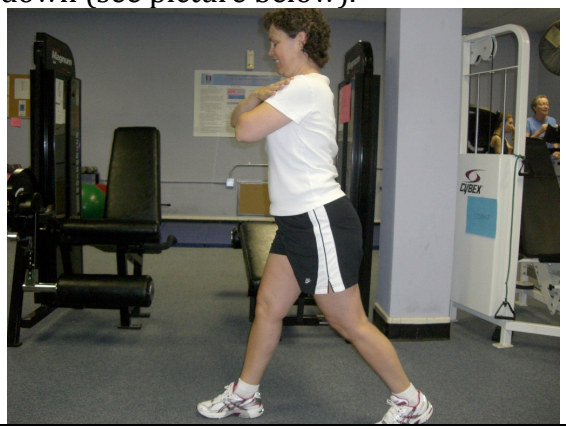
For the chest exercise, choose only one, the one most appropriate for you. Level 3, wall push-ups is the not-so-hard one!!! 1-3 sets / 12 repetitions per set)

3. Back (1-3 sets / 12 repetitions each arm) Keep your back straight!!!



4. Arm Curls (If you don't have a dumbbell, you can use canned food).

You can do both arms or alternate each arm (1-3 sets / 12 repetitions).

5. Squats  (No weights necessary. Pay attention to your form. Do not let your knees go past your toes). Only go to 90 degrees maximum when squatting). 1- 3 sets / 15 repetitions.	5a. If you have a fit ball at home, then you know what to do, right? 
6. Lunges (start standing and then move down (see picture below). 	1-3 sets with each leg. 12 repetitions 

7. Calf Raises 	1-3 sets / 15-20 repetitions 

Core workout –
For core exercises, perform 3 sets of each exercise. 12-20 repetitions per set for each exercise. Your abs will look even better than they look now.

1. Crunches 	
2. Obliques 	

3. Lower Abdominal (The Bicycle Abs) 	**Have fun and enjoy!**

Appendix B

Exercise Log
(The Spanish version of Appendix B, was given to participants)

Get REAL and HEEL Exercise Log Name/ID_____

Date/Time	CARDIO Type of Activity and Duration Intensity (RPE)	STRENGTH Type of Activity and Duration Intensity (RPE)	STRETCHING Type of Activity and Duration Intensity (RPE)

REFERENCES

American Cancer Society. (2009). Retrieved March 18, 2009, from the world wide web: http://www.cancer.org/downloads/STT/CAFF2006HispPWSecured.pdf

American Cancer Society. (2009). Retrieved March 20,2009, from the world wide web: http://www.cancer.org/downloads/STT/2008CAFFfinalsecured.pdf

Adamsen, L., Midtgaard, J., Roerth, M., Andersen, C., Quist, M., Moeller, T. (2004) Transforming the nature of fatigue through exercise: qualitative findings from a multidimensional exercise programme in cancer patients undergoing chemotherapy. *Euro J. Cancer Care,* 13, 362-370

Battaglini, C. L., Boltaro, M., Campbell, J. S., Novaes, J., Simao, R. (2004). Physical activity and levels of fatigue in cancer patients. *Rev. Bras. Med. Esporte, 10* (2), 105-110.

Battaglini, C. L., Dennehy, C. A., Groff, D., Kirk, D., Anton, P.M. (2006). Complementary therapies in the management of cancer treatment-related symptoms: the individualized prescriptive exercise intervention approach, *Med. Sportiva,* 10(2), 49-57

Bower, J.D., Ganz, P.A., Desmond, K.A., Rowland, J.H., Meyerowitz, B.E., Belin, T.R. (2000). Fatigue in breast cancer survivors: occurrence, correlates, and impact on quality of life. *J. Clin. Oncol. 18,* 743-753.

Brady, M.J., Cella, D.F., Mo, F., Bonomi, A.E., Tulsky, D.S., Lloyd, S.R., Deasy, S., Cobleigh, M., Shiomoto, G. (1997). Reliability and validity of the functional assessment of cancer therapy breast quality of life instrument. *J. Clin. Oncol. 15*(3), 974-986.

Cella, D.F. (1994). Quality of life: concepts and definitions. *J. Pain Symptom Manage,* 9(3),186-192

Courneya, K.S., Freidenreich, C.M., Sela, R.A., Quinney, H.A., Rhodes, R.E., Handman, M. (2003). The group psychotherapy and home based physical exercise (group-hope) trial in cancer survivors: physical fitness and quality of life outcomes. *Psycho-Oncol. 12,* 357-374.

Dimeo, F., Schwartz, S., Wesel, N., Voigt, A., Thiel, E. (2008). Effects of an endurance and resistance exercise program on persistent cancer-related fatigue after treatment. *Ann. Oncol.* 19(8):1495-9

Durak, E.P., Lilly, P.C. (1998). The application of an exercise and wellness program for cancer patients: a preliminary outcomes report. *J. Strength Cond. Res.* 12(1), 3-6.

Friedenreich, C. M., Cust, A. E. (2008). Physical activity and breast cancer risk: impact of timing, type and dose of activity and population subgroup effects. *Br. J. Sports Med.* 42, 636-647

Galvao, D. A., Newton, R. U. (2005). Review of exercise intervention studies in cancer patients. *J. Clin. Oncol.* 23(4), 899-909

Gilliland, F.D., Li, Y., Baumgartner, K., Crumley, D., and Samet, J.M. (2001). Physical activity and breast cancer risk in Hispanic and non-Hispanic white women. *Am. J. Epidemiol*. 154(5), 442-450

Hann, D., Winter, K., Jacobsen, P. (1999). Measurement of depressive symptoms in cancer patients: evaluation of the center for epidemiological studies depression scale (CES-D). *J. Psychosomatic Res.* 46(5), 437-443.

Holmes, M.D., Chen, W.Y., Feskanich, D., Kroenke, H.C., Colditz, G.A. (2005). Physical activity and survival after breast cancer diagnosis. *JAMA, 293* (20), 2479-2486.

Hughes, D.C., Leung, P., Naus, M.J. (2008). Using single-system analyses to assess the effectiveness of an exercise intervention on quality of life for Hispanic breast cancer survivors: a pilot study. *Soc. Work Health Care.* 47(1), 73-91

Irwin MA, Smith W, McTiernan A, Ballard-Barbash R, Cronin K, Gilliland FD, Baumgartner RN, Baumgartner KB, and Bernstein L. (2008). Influence of pre- and postdiagnosis physical activity on mortality in breast cancer survivors: the health, eating, activity, and lifestyle study. *J. Clin. Oncol.* 26, 3958 – 3964.

Johnson-Kozlow, M., Sallis, J.F., Gilpin, E.A., Rock, C.L. and Pierce, J.P. (2006). Comparative validation of the IPAQ and the 7-day PAR among women diagnosed with breast cancer. *Int. J. Behav. Nutr. Phys. Act.,* 3:7

Kolden, G.G., Strauman, T.J., Ward, A., Kuta, J., Woods, T.E., Schneider, K.L., Heerey, E., Sanborn, L., Burt, C., Millbrandt, L., Kalin, N.H., Stewart J.A., and Mullen, B. (2002). A pilot study of group exercise training (GET) for women with primary breast cancer: feasibility and health benefits. *Psycho-Oncol.,* 11, 447-456.

Marquez, D.X., McAuley, E. (2006). Gender and acculturation influences on physical activity in Latino adults. *Ann Behav Med*. 31(2), 138-144

Matthews, C.E. (2005). Calibration of accelerometer output for adults. *Med. Sci. Sports Exerc.* 37(11), S512-S522

Matthews, C.E., Wilcox, S., Hanby, C.L., Der Anania, C., Heiney, S.P., Gebretsadik, T., Shintani, A. (2007). Evaluation of a 12-week home-based walking intervention for breast cancer survivors. *Support Care Cancer.* 15, 203-211

McNeely, M.L., Campbell, K.L., Rowe, B.H., Klassen, T.P., Mackey, J.R., and Courneya, K.S. (2006). Effects of exercise on breast cancer patients and survivors: a systematic review and meta-analysis. *CMAJ* 175(1), 34-41

National Cancer Institute (2009) Retrieved March 20, 2009 from the world wide web: http://www.cancer.gov/cancertopics/types/breast

National Cancer Institute (2009) Retrieved March 20, 2009 from the world wide web: http://riskfactor.cancer.gov/tools/nhanes_pam/create.html

National Cancer Institute (2008) Retrieved October 18, 2008 from the world wide web: http://www.cancer.gov/cancertopics/pdq/treatment/breast/patient/page5

Owens, B., Jackson, M., Berndt, A. (2009). Pilot study of a structured aerobic exercise program for Hispanic women during treatment for early-stage breast cancer. *MEDSURG Nursing.* 18(1), 23-32.

Pfeiffer, K.A., McIver, K.L., Dowda, M., Almedia, M.J.C.A., and Pate, R.R. (2005). Validation and calibration of the actical accelerometer in preschool children. *Med. Sci. Sports Exerc.* 38 (1), 152-7

Pinto, B.M., Frierson, G.M., Rabin, C., Trunzo, J.J., Marcus, B.H. (2005). Home-based physical activity intervention for breast cancer patients. *J. Clin. Oncol.* 23(15), 3577-3587.

Piper, B.F., Dibble, S.L., Dodd, M.J., Weiss, M.C., Slaughter, R.E., Paul, S.M. (1998). The revised piper fatigue scale: psychometric evaluation in women with breast cancer. *Oncol. Nurs. Forum. 25*(4), 677-84.

Porock, D., Kristjanson, L.J., Tinnelly, K., Duke, T., Blight, J. (2000). An exercise intervention for advanced cancer patients experiencing fatigue: a pilot study. *J Palliat Care.* 16(3), 30-36

Puyau, M. R., Adolph, A. L., Vohra, F. A., Zakeri, I., and Butte, N. F. (2004). Prediction of activity energy expenditure using accelerometers in children. *Med. Sci. Sports Exerc*. 36(9),1625-1631.

Segal, R., Evans, W., Johnson, D., Smith, J., Colletta, S., Gayton, J., Woodard, S., Wells, G., Reid, R. (2001). Structured exercise improves physical functioning in women with stages I and II breast cancer: results of a randomized controlled trial. *J. Clin. Oncol*. 19, 657-665.

Segar, M.L., Katch, V.L., Roth, R.S., Garcia, A.W., Portner, T.I., Glickman, S.G., Haslanger, S., Wilkins, E.G. (1998). The effect of aerobic exercise on self-esteem and depressive and anxiety symptoms among breast câncer patients. *Oncol. Nurs. Forum. 25*(1), 107-113.

Smith, A.W., Alfano, C.M., Reeve, B.B., Irwin, M.L., Bernstein, L., Baumbartner, K., Bowen, D., McTiernan, A., Ballard-Barbash, R. (2009). Race/ethnicity, physical activity, and quality of life in breast câncer survivors. *Cancer Epi. Biomark. Prev.* 18(2), 656-663.

Valenti, M., Porzio, G., Aielli, F., Verna, L., Cannita, K., Manno, R., Masedu, F., Marchetti, P., Ficorella, C. (2008). Physical exercise and quality of life in breast cancer survivors. *Int. J. Med. Sci.* 5(1), 24-28.

Ward, D.S., Evenson, K.R., Vaughn, A., Rodgers, A.B., and Troiano, R.P. (2005). Acclerometer use in physical activity: best practices and research recommendations. *Med. Sci. Sports Exerc.* 37(11), S582-S588

Watlington, A.T., Byers, T., Mouchawar, J., Sauala, A., and Ellis, J. (2007). Does having insurance affect differences in clinical presentation between Hispanic and non-hispanic white women with breast cancer? *Cancer* 109(10), 2093-95